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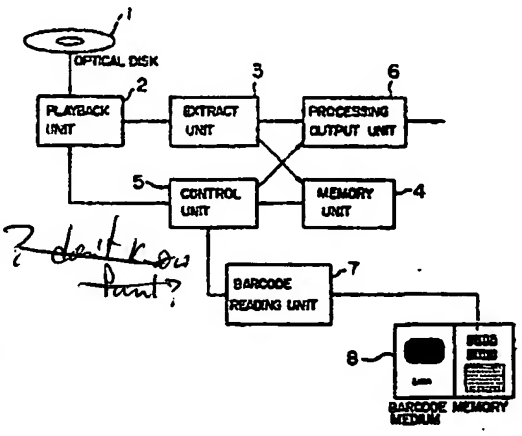
(54) Optical-disk playback apparatus, method of optical-disk playback and combined memory medium.

(57) In an optical-disk playback apparatus which plays back an optical-disk on which control programs defining the operations of said optical-disk playback apparatus and other informations are recorded, that is, in an optical-disk playback apparatus operable by a combination of an optical-disk such as a laser disk or CD and a printed matter on which barcodes are pinted, by recording predetermined programs defining the operation of said optical-disk playback apparatus corresponding to said barcodes, the following two advantages, i.e., that variable, complicated and yet flexible optical-disk playback operations which are not fixed at the first system designing stage can be accomplished by simply tracing said printed barcode because the operation of optical-disk playback apparatus is controlled by the control programs recorded in said optical disk, and that troubles which might happen when optical-disk and barcode of different system are combined can be prevented since the one-to-one correspondence between barcode and optical disk code is established beforehand, can be accomplished.

FIG. 1



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Description

OPTICAL-DISK PLAYBACK APPARATUS, METHOD OF OPTICAL-DISK PLAYBACK AND COMBINED MEMORY MEDIUM

BACKGROUND OF THE INVENTION

This invention is related to an optical-disk playback apparatus capable of selective playback of desired informations from an optical-disk on which informations are prerecorded. As the utilization of optical-disks such as the compact-disc and laser-disk on which video and audio informations are recorded became wide spread recently, demands for higher degrees of usage such as the random access functions are increasing beside the requirements for higher picture and audio qualities. However, instead of complicated conventional search methods using ten-keys and search buttons, a simpler and more convenient search method operable by any operator is considered essential.

As one of such search methods, an interactive video training system with barcode disclosed by U. S. P. 4,481,412 had been known. In this system, video-disks on which various training materials are recorded, are used together with a content table identifying the titles of training material and the workbook carrying barcodes of said titles. This system consists of a barcode reader to read the barcode, video-disk player to play the training material recorded in said video-disk, and a microcontroller to control the video-disk player according to the input from the barcode reader. The operator can inform the type of desired information to said system by reading the barcode printed in the workbook. The microcontroller interprets the input barcodes and outputs a control signal to the video-disk player to output desired informations. The video-disk, upon receiving said control signal, outputs the desired informations. By using this system, the operator can retrieve the desired informations from said video-disk simply by tracing the printed barcode by a barcode reader.

However, this system includes the problems described in the following. First of all, since the video-disk operations corresponding to each of barcodes is determined by the microcontroller incorporated in the system, the types of function attainable by the barcode are set unchangeable at its designing stage. For example, if a barcode was assigned to reproduce a specific section of video-disk, this barcode can not be assigned to reproduce more than one section of video-disk if it was desired at a later stage. Furthermore, since the video-disk operation corresponding to each barcode is determined by the microcontroller, the microcontroller designed to meet with one video-disk is unable to meet to the other video-disks depending on the cases. For example, a video-disk on which numerous training materials recorded in an unit of one minute is incompatible with video-disks on which training materials are prepared in an unit of 30 seconds. Therefore, the barcode has to be prepared universal in order to be able to meet with various types of video-disk and workbook, and for this, complicated and troublesome operations for retrieving a desired information become essential.

Moreover, if various video-disk functions common throughout these various video-disk systems such as the starting of play, pause, search, etc. are attempted to standardized in terms of barcode system, one of these function barcodes has to be read first and then the barcodes for the information has to be read in every playback operation, making the operation more complicated. Furthermore, if barcodes capable to meet with entire possible sets of functions corresponding to plural video-disks and workbooks were attempted to prepare, the numbers of possible functions would be almost infinite, and so the numbers of barcodes also which are impossible to realize. Further, the microcontroller and its software designed for each barcode system has to be replaced every time when the type of video-disks and their associated workbooks are altered, and this is nearly an impossible task to carry out.

In addition to above, since the conversion of barcode to a control information signal by a microcontroller is independent of informations recorded on a video-disk, troubles would be happen when a correspondence is not established between barcode and video-disk. For example, a video-disk with no correspondence to a barcode were inserted in a video-player to which a wrong instruction read by barcode-reader were given by mistake, an access to a non-recorded section on the disk, or an access to video or audio informations undesired by the operator might take place.

SUMMARY OF THE INVENTION

The purpose of this invention is to solve the above described problems, that is, this is to realize a flexible optical-disk playback apparatus of which functions attainable by each of codes are not initially determined at its original designing stage, yet attaining complicated functions by tracing said codes by storing the control programs defining the operations of optical-disk playback apparatus corresponding to each of codes (such as those barcodes printed on the printed matters). Furthermore, by establishing an one to one correspondence between the code and optical-disk, mistakes which might happen by an unmatched combination of optical-disk and code, can be prevented. The optical-disk playback apparatus of this invention attaining the above described aims consists of an optical-disk playback unit to playback an optical-disk to output recorded informations, extractor unit to extract control programs from the informations output from said playback unit, memory unit to store said control program output by said extractor unit, processing output unit to process and output informations other than said control programs among the informations output from said playback unit, code reading unit which reads said code out of a recording medium in

which the code corresponding to specific operation of said optical-disk is recorded and outputs the operation code converted from the read code, and a control unit which controls the playback unit or the processing unit according to a specific operation.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a block diagram of an embodiment of opticaldisk playback apparatus of this invention;

Figure 2 shows a detailed block diagram of the same embodiment shown in Figure 1;

Figure 3 shows a cross-section of optical-disk;

Figure 4A shows a schematic diagram of frame for optical-disk;

Figure 4B shows a schematic diagram of sub-code frame;

Figure 4C shows a schematic diagram of optical-disk pack;

Figure 5A is a schematic of plural control programs;

Figure 5B is a schematic of a control program;

Figure 5C is a schematic of compound command;

Figure 5D is a schematic of control commands;

Figure 5E is a schematic of control programs stored in the pack;

Figure 6A shows a spread of book on which barcodes of a first embodiment are printed;

Figure 6B shows a structure of program information stored in the optical disk of the first embodiment;

Figure 6C shows a spread of book on which barcodes of a second embodiment are printed;

Figure 6D shows a structure of program informations stored in the optical-disk of the second embodiment;

Figure 7A shows a schematic diagram of data recorded in a form of barcode;

Figure 7B shows a barcode module correlations;

Figure 8 is a flowchart showing the operations of control unit of the first embodiment; and

Figure 9 is a flowchart showing the operations of control unit of the second embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The explanations on this optical-disk playback apparatus, the method of optical-disk playback and the combined recording medium are now described referring those drawings showing a first embodiment of the invention. This is an embodiment of which optical-disk apparatus control program is consisted of combined plural fixed fundamental commands employed by conventional optical-disk playback apparatus.

Fig. 1 shows a block diagram of optical-disk playback apparatus of the present invention where the numeral 1 is an optical-disk, 2 is a playback unit, 3 is an extract unit, 4 is a memory unit, 5 is a control unit, 6 is a processing output unit, 7 is a barcode reading unit, and 8 is a barcode memory medium.

The explanation for the optical-disk playback apparatus thus constituted is now described in the following. A plurality of control programs defining the operations of optical-disk playback apparatus is recorded on the optical-disk 1, and the barcodes defining the operations of said optical-disk playback apparatus are printed on a barcode memory medium.

When an optical-disk 1 is set in this optical-disk playback apparatus, said control unit 5 derives an instruction to said playback unit 2 to playback the recording on an instructed location by means of plural control programs recorded on the optical-disk 1. Upon receiving said instruction, the playback unit 2 plays back the recording on said instructed location on the optical-disk 1, and the played back signal containing plural control programs are transferred to the extraction unit 3 where the extraction of plural control programs out of played back signal is carried out for storing these in the memory unit 4.

At this condition, the optical-disk playback apparatus becomes a condition where the barcodes corresponding to said optical-disk set in the apparatus and recorded on the barcode recording medium, can be interpreted, and the playback of optical-disk 1 becomes possible by the barcode instruction made by an operator.

The followings are the explanation for the concrete constituting elements of instructions, and this is begun with the data format of optical-disk 1. In this embodiment of optical-disk, a laser vision disk (hereinafter, this is called as LV) on which audio and video informations are recorded is exemplified, and furthermore, a CAV laser disk of a constant rotating speed of 1800 rpm type among CAV and CLV type laser disks are explained here.

Analog video signals as the video information and both analog and digital audio signals as the audio information are recorded on said LV. The analog video signal is an NTSC video signal of which synchronizing chip is clamped at 7.6 MHz, its white peak is set at 9.3 MHz, and it is FM modulated with its pedestal level set at 8 MHz. The analog audio signal of two channels are FM modulated at 2.3 and 2.8 MHz respectively. The band of digital audio signal is limited below 2 MHz after EFM (Eight-to Fourteen) modulation of it is conducted. The EFM modulated digital audio signal, FM modulated analog video signal and FM modulated analog audio signals are frequency-division multiplexed for recording.

The digital audio signal is recorded by using a format same as the one used for the compact-disc (or CD) which is an optical disk on which only digital audio signal is recorded.

In this embodiment, the recording of plural control programs is made by time-division multiplexing on the sub-channel, and this, in turn, is to be recorded on the main channel for digital audio signals.

The digital audio data format for the optical-disk 1 on which said plural control programs are to be

recorded is now explained referring Figs. 3 and 4. Fig. 3 is a cross-section of optical-disk 1 showing its construction. The center hole, lead-in part 31, the analog audio, digital audio signals, and program area 32 on which frequency multiplexed analog video signal is recorded, and a lead-out area 33 showing the end of disk are arranged on the optical-disk from the disk center toward the outer rim. A schematic of digital audio signal to be recorded on the optical-disk 1 is shown in Fig. 4 were Fig. 4A shows a schematic of frame which is a minimum recording unit, Fig. 4B shows a schematic of sub-code frame, and Fig. 4C shows a schematic of pack.

The digital audio data is recorded on the disk at a rate of 7350 per second in an unit of frame shown in Fig. 4A. The unit frame consists of a sub-channel memory part 42 of one byte, main channel memory part 43 of 32 bytes, and a frame synchronization part 41.

The two channel audio data quantized by a sampling frequency of 44.1 kHz and quantization bit number of 16 bits are divided in every 24 byte as the main data before being recorded on the main channel memory part 43 together with the 8 byte error detecting and correcting code. A sub-data called sub-code of one byte is recorded on the sub-channel memory part 42, and each bit of said sub-code of one byte corresponds to the respective channels named P, Q. R, S, T, U, V, and W channels. This means that there exist eight sub-channels in the sub-channel memory part 42.

The sub-code frame is thus constituted in the sub-channel memory part 42 by the continuous 98 frames which is shown in Fig. 4B. The sub-code frame synchronization part 44 is constituted by the sub-channel memory part 42 corresponding to first two frames, and the sub-channels of P to W channels are recorded in the sub-channel memory part 42 corresponding to the rest of 96 frames.

The six sub-channels from R to W channels (hereinafter, it is called as R - W channels) are integratedly dealt. Six bits of R - W channels are called symbol, and 96 symbol units constitute a packet.

Plural control programs are recorded in the packets locating in the R - W channels, and by allocating the lead-in part 31 for a physical part on which the control programs are to be recorded, said plural control programs can be read before the playback of program part 32 of optical disk 1 is started. One packet is divided into 24 symbols, and packs 47, 48, 49, 410 are constituted of 24 symbols.

Fig. 4C shows a schematic diagram of pack comprised of the command part 411 of one symbol, instruction part 412 of one symbol, parity part 413 of two symbols, user-data part 414 of 16 symbols, and the parity part 415 of four symbols which are arranged from the top. The command part 411 is for defining the contents of recording within symbol, and the upper three bits in the command part are called mode bits, and the lower three bits are called item bits. The mode 0 (000) and item 0 (000) are called 0 mode, and all the symbols within the pack are 0s. The most of conventional disks employs this mode. The mode 7 (111), item 0 (000) are defined to as the user mode which is used in the present embodiment. That is, the control programs are recorded in the pack of which command part takes the mode 7.

The instruction part 412 is used as an identifier for the control programs recorded in the pack. The lower first bit of instruction part 412 is assigned to the initiation bit and the second bit is assigned to the termination bit. That is, 1 (000001) is recorded in the instruction part 412 of the first pack on which plural control programs are recorded, and 2 (000010) is recorded in the instruction part 412 of the last pack at which the recording of plural control programs is terminated. 0 (000000) is recorded in the instruction part 412 except those in the first and last packets.

If the recording of plural control programs are completed within one pack, 3 (000011) which gives 1s for both the initiation bit and termination bit is recorded in the instruction part 412 of corresponding pack. The data to be recorded in the pack are dealt in an unit of byte of 8 bits, and the data of 12 bytes are recorded in one pack.

As for the format of plural control programs, explanations are now given referring Fig. 5 wherein Fig. 5A gives a schematic diagram of plural control programs to be recorded, Fig. 5B shows a schematic of control program, Fig. 5C is a schematic of compound command, and Fig. 5E gives a schematic diagram showing an example of control programs recorded in the user data part 414.

The plural control programs are provided with a format shown in Fig. 5A, and each control program is divided by a SYNC code (11111111) of one byte, and the termination of control program is manifested by a train of recording of separator codes in the SYNC code. A disk ID code is recorded in the top control program, and the operation codes and their corresponding compound codes are recorded in the control programs other than the top control program.

The ID and operation codes are explained in the following referring Fig. 5B. The disk ID code is consisted of two bytes, and disk proper unique numerals are allocated for this. This code corresponds to the disk ID code in the barcode printed on barcode memory medium. This disk ID code is utilized to establish a proper correspondence between optical disk 1 which is a combined memory medium and barcode memory medium 8.

When the barcodes of memory medium which lack of correspondence to the optical disk 1 set in the optical disk playback apparatus are read, the playback apparatus excludes erratic operations, and warns the wrong combination of optical disk 1 and barcode memory medium 8.

The operation code consists of two bytes which correspond to the operation code recorded in the barcode. When a barcode is read out of said barcode memory medium 8, a control program having an operation code corresponding to the operation code recorded in said barcode is selected, and the compound command contained in the selected control program is executed.

As shown in Fig. 5C, the compound command

consists of more than one control commands each of which is partitioned by a separator code of one byte. As shown in Fig. 5D, the control command consists essentially of a control code of one byte and a succeeding attribute code of one byte. Some of the control command possesses additional one or two frame codes succeeding to above mentioned attribute code, and these control commands define the control operations of minimum unit for playback apparatus.

The control codes are allocated for the playback operations of optical disk playback apparatus, or more concretely, it is assigned for the commands for playback starting, playback ending, pause, search, multi-speed playback, etc. The detail of attribute codes is prepared for each control code, and the operations to be executed accompanying to the execution of control code are defined. For example, those are consisted of the designation of audio channel, ON/OFF of audio output, ON/OFF of video output, etc.

The playback speed is also defined by the attribute code commanding multi-speed playback. A frame number which gives the address of analog video signal for the optical disk 1 is recorded in the frame code, and the recording of said frame number is conducted at an accuracy of 1/30 second in the optical disk 1, and the required number of frame codes is different depending on the type of control code. For example, if the control code is a playback command, two frame code types including the playback starting frame code and playback ending frame code are recorded, if the control code is a search command, one type of frame code aimed for conducting the search is recorded, and if the control code is a control operation which does not require frame code such as the playback ending command, the frame code is not recorded.

The above described plural control programs are divided into 12 bytes units from its top, and those are recorded in the user data part 414 in the pack. This is shown in Fig. 5E in various code levels.

The barcode memory medium 8 on which the barcodes are recorded is explained now referring Fig. 6A and Fig. 6B, and the present explanation is made taking an example for a case where said barcode memory medium 8 is an animal encyclopedia. Fig. 6A shows a spread of one page of said animal encyclopedia, Fig. 6B is a construction of program informations recorded in an optical disk 1 together with its frame numbers. Said barcode memory medium 8 is an animal encyclopedia, and Fig. 6A shows a page spread showing lion. The numerals 61 and 62 designate the barcodes wherein the ID and operating codes are recorded.

The disk ID code is a unique numbers specifying the correspondence between barcode memory medium 8 and optical-disk 1. The operation code is the numbers to specify a particular operation program among plural control programs recorded in the optical-disk 1. 61 is the barcode instructing the playback of "outline of lion", and 62 is the barcode instructing the playback of "short highlight" by which the outline of lion is played back within a period shorter than that of 61. The optical-disk frame numbers of each program informations instructing the playback by the barcodes 61 and 62 are shown in Fig. 6B. The content of "outline of lion" indicated by the barcode 61 is recorded in the frame numbered from a to a+900. The content of "short highlight" indicated by the barcode 62 is excerpted from the program informations for the "outline of lion", and is recorded in the four frames each numbered by the numbers of a to a+100, a+300 to a+400, a+500 to a+600, and a+700 to a+800 respectively. The control programs selected by the operation code recorded in the optical-disk are defined as follows in the examples of "outline of lion" and "short highlight".

The operating code expressed by the barcode 61 is defined by a compound command consisting in one control command reproducing the frame number a to a+900 among corresponding control programs, and the operation code expressed by the barcode 62 is defined by a compound command consisting of four control commands reproducing the frames with frame numbers of a to a+100, a+300 to a+400, a+500 to a+600, and a+700 to a+800 respectively among corresponding control programs.

The playback command instructed by the barcode 62 is far more complicated than that instructed by the barcode 61. However, the barcode 62 of which amount of information is same as that of barcode 61, can execute the operations far more complicated than that of barcode 61 by giving the operation codes by means of barcodes and by recording the corresponding control programs on the optical-disk.

The formats of ID and operation codes recorded in terms of barcode are explained in the next by referring Figs. 7A and 7B. Fig. 7A shows a schematic diagram of data recorded in a barcode form, and Fig. 7B shows a barcode module correlationship showing correlationship between the number indicated by each character and the module having a barcode pattern corresponding to a character. The barcode employed is a barcode taking an account of the standard of UPC code. The barcode employed in this embodiment consists of 12 characters along the UPC standard code, and each character consists of 7 modules as shown by Fig. 7B.

The module represents the black bar by 1 and white by 0, and any one character is represented by a combination of 7 modules in the decimal system using numerals 0 to 9. The first character is assigned for the character number, the characters from the second to sixth are assigned for the disk ID codes, the characters from the seventh to eleventh are assigned for the operation codes, and the 12th character is utilized as the check digit.

The disk ID codes are unique numbers determined by the disk software such as the animal, human, or plant encyclopedia, and is used for preventing wrong combinations between barcode memory medium 8 and optical-disk 1. The operation code is a code necessary to select one particular program out of plural control programs recorded on the optical-disk 1. The check digit is for the detection of error which might happen at the barcode scanning.

yes.

The details and operations of elements constituting the optical-disk playback apparatus are explained below by referring Figs. 1, 2, and 8. Fig. 1 is a block diagram showing the functions of optical-disk playback apparatus, and its details are given in Fig. 2. Fig. 8 is a flowchart showing the operation of control unit 5. The playback unit 2 consists of a pick-up 20, preamplifier 21, address decoder 22, motor 23, and a controller 24.

The individual operation of each constituting element of playback unit 2 is given in the following. The pick-up 20 projects laser light on the optical-disk for retrieving the information recorded therein as the playback signal d1 which is amplified and output by the preamplifier 21. The motor 23 is to drive the optical-disk 1. The demodulated video playback signal d11 is input to the address decoder 22 for extracting and output the frame number information d40 which is an address information of optical-disk 1 recorded superposed on the video playback signal d11. The controller 24 consists in an one-chip microcomputer. The spindle servo is applied to the motor 23 according to both the frame number information output from the address decoder 22 and the control information d32 output from the control unit 5, and the tracking servo and focus servo are applied to the pick-up 20 which is traversed for the playback of optical-disk 1.

Explanations are now given to the above described constitution of playback unit 2 which plays back the designated part of optical-disk 1 by the control information d32 derived from the control unit 5. The amplified playback signal d2 is output from the preamplifier 21, and the detection of assigned location on the disk is conducted by detecting the frame number contained in the analog video signal d11.

As shown in Fig. 2, the extraction unit 3 is constituted of MTF25, LPF26, LPF27, BPF28, BPF29, BPF210, data-slicer 211, EFM demodulating circuit 212, selector 213, and a data decoder 214. The individual functions of the elements constituting said extraction unit 3 are as follows. MTF25 is for the MTF (modulation-transfer-function) compensation, and it controls the gain of AGC (automatic gain control) circuit for compensating the difference of amplitudes of playback signal d2 which takes place between the outer and inner rims of optical-disk.

The LPFs 26 and 27 are the low-pass filters, LPF27 is to pass the frequency components below 3 MHz for removing the analog-video signal out of playback signal d3. LPF26 is to pass the frequency components below 2 MHz for removing the signal components other than the digital audio components out of playback signal d2. The BPFs 28, 29, and 210 are band-pass filters, and BPF29 is to pass the frequency components within 2.3 MHz ± 100KHz, and BPF 210 is for 2.8 MHz ± 100KHz for obtaining two channel analog audio components d6 and analog audio component d7 respectively. BPF28 is to pass the frequency components within 3.5 to 15 MHz for obtaining the analog video signal component d5. The data-slicer 211 is to obtain the binary expression of playback signal d14.

The EFM demodulator 212 conducts EFM (eight to fourteen demodulation) after the synchronism detection of input signal d15 in binary expression for transforming it into a digital data train d16 which is further input to the selector 213 where it is divided into the time-divisioned main channel data d17 and the sub-channel data d36 for output.

The sub-channel data d37 is input to the data-decoder 214 where the synchronism and error detections and error correction of R - W channels are carried out. Furthermore, considering the command and instruction data for each pack, it outputs plural control programs recorded in the user data part 414 in the pack where the termination bit is indicated among the packs which show the starting bit of instruction data and its command data takes the mode 7 and item 0.

The operations of extract unit 3 constituted as above are now explained in the following. The playback signal d2 from the playback unit 2 is input to the extraction unit 3 where the analog video component is extracted through MTF25 and BPF28, and two channel analog audio components are extracted through MTF25, LPF27, BPF29 and BPF210, and the digital audio component is extracted through LPF26 for output. Said analog video component d5, two channel analog audio components d6 and d7 are output directly from the extract unit 3.

The digital audio component d14 is transformed into its binary expression in the data-slicer 211, and is demodulated into a digital data train d16 by the EFM demodulating circuit 212. This data train d16 is further divided into a main channel d17 and sub-channel data d37 in the selector 213 for the output. The main channel data d17 among the digital data train d16 is directly output from the extract unit 3. Plural control programs are extracted from the sub-channel data d37 among the digital data train d16 in the data-decoder 214, and these extracted plural control programs are output out of the extract unit 3.

As shown in Fig. 2, the processing output unit 6 consists of the FM demodulating circuits 215, 216, 217, de-emphasis circuits 218, 219, 220, SW blocks 225, 226, 227, EDC·ECC circuit 221, D/A 222, and LPFs 223 and 224. The followings are the explanation for the individual elements constituting the processing output unit 6.

The FM demodulating circuits 215, 216, and 217 conduct the frequency demodulation of input signals d5, d6 and d7. The de-emphasis circuits 218, 219, and 220 conduct the reduction of noise produced by said modulation and demodulation. The EDC·ECC circuit 221 conducts the error detection and correction process on the main channel data d17, and it outputs 16 bit digital audio data d18. D/A 222 conducts the digital to analog conversion. LPFs 223 and 224 pass through the audio components below 20 KHz of input signals d19 and d20 respectively. SW blocks 225, 226, and 227 are switches, and operate the ON/OFF of output according to the control signals d23, d24, and d25 derived from the control unit 5.

The operations of said processing output unit 6 of above described constitution are now explained

below. The processing output unit 6 conducts the signal processing shown below on the playback signal components other than the control programs. As for the analog video component d5, it is demodulated by the FM demodulating circuit 215, and its noise reduction processing is conducted in the de-emphasis circuit 218 before it is externally output as an analog video signal through the SW block 225.

The two channel analog audio components d6 and d7 are demodulated by the FM demodulating circuit 216 and 217 respectively, and their noises are reduced in the de-emphasis circuits 219 and 220 respectively before these are externally output as analog audio signals through the SW block 226.

As for the main channel data d17, the error detection and correction process is conducted on it in the EDC·ECC circuit, and the digital to analog conversion of it is conducted in the D/A 222 for converting it to two channel analog audio signals d19 and d20 of which high-band noises are reduced through LPFs 223 and 224 before these are output. Furthermore, the SW block 225 conducts the analog video signal ON/OFF, the SW block 226 conducts the analog audio signal ON/OFF, and the SW block 227 conducts the ON/OFF of analog audio signal output played back from digital audio data recorded on the optical-disk. These ON/OFF controls are conducted obeying the instructions given by the control unit 5.

The constituting elements of barcode read unit 7 and the operation of this is then explained in the following. The light emitted from a light emitting diode housed in the barcode sensor 234 is projected on the printed barcode to obtain its reflection which is detected by a light detecting device where the barcode stripe pattern is transformed into light intensity variations which are eventually transformed into electrical signals of barcode for output.

The electrical output signal from the barcode sensor 234 is amplified by the digitizer 235, and is converted into a digital signal d34 in reference of a threshold value. Said digital signal d34 output from the digitizer 235 is converted into the binary ID and the operation codes, and the error detection and correction are conducted thereon. These are stored in the register 237 if these are found normal.

The memory unit 4 is a random access memory (RAM, hereafter), and is connected to the internal bus d30 of control unit 5 for storing the plural control programs derived from the extract unit 3 through the input buffer 229. As shown in Fig. 2, the control unit 5 consists of a micro-processor 232, ROM 228, input buffers 229 and 230, I/O buffer 231, and the output latch 233 connected through a bus line.

The following is an explanation for the individual constituting elements of control unit 5. The microprocessor 232 is an 8 bit microprocessor. ROM 228 is a read-only memory connected to the internal bus d30, and the executing programs being executed by said microprocessor are stored therein.

The input buffers 229 and 230 constitute a parallel port connected to the internal bus d30, and execute the buffering of input data. The I/O buffer 231 is a serial port, and is connected to the internal bus d30 for conducting the buffering of I/O data. The I/O buffer 231 conducts a parallel to serial conversion (P.S. conversion, hereafter) of the control information transmitted from the microprocessor 232 to the controller 24, and conducts a serial to parallel conversion (S/P conversion, hereafter) of the status information sent from the controller 24 to the microprocessor 232. The output latch 233 is an 8 bit output latch connected to the internal bus d30, and uses only the upper three bits.

The operations of control units 5 thus constituted are now explained in the following. When an optical-disk 1 is set in the playback apparatus, the microprocessor 232 supplies a control information to initiate the playback from the lead-in part 31 through the buffer 231. When the plural control programs extracted from the extract unit 3 is given to the control unit 5 through the data decoder 214, the microprocessor 232 transmits the control program to the memory unit 4 through the input buffer 229 and the internal bus d30.

On the other hand, when the barcode is read in the barcode read unit 7, the microprocessor 232 reads out the operation codes stored in the register 237 in the barcode read unit 7 and the ID codes through the input buffer 230. Since these codes are of BCD code, the microprocessor 232 converts these into the corresponding binary code of 16 bits.

The microprocessor 232 then compares the converted disk ID codes to the disk ID codes stored in the memory unit 4. If a discrepancy is found between these two, the microprocessor 232 cancels the input made by said barcode, and if these are coincided, the corresponding control programs are read from the plural control programs stored in the memory unit 4, and the compounds command defined by said control programs are sequentially executed. Saying in a more concrete form, the control information d32 is output through I/O buffer 231 for the playback unit 2, and the control signals d23, d24, and d25 which instruct ON/OFF to each corresponding switch blocks through the output latch 233 for the processing output unit 6.

The operation of optical-disk playback apparatus on this embodiment comprised of an optical-disk 1, playback unit 2, extract unit 3, memory unit 4, control unit 5, processing output unit 6, barcode read unit 7, and barcode memory medium 8, is now explained in the following.

The playback unit 2, upon detecting the setting of optical-disk 1 in the playback apparatus by an optical-disk detector which is not shown, informs this as a status information to the control unit 5 through the signal line S2. The control unit 5 outputs a control command to instruct the playback of lead-in part 31 of optical-disk 1 to the playback unit 2 which starts the playback of optical-disk 1.

Since no meaningful audio and video informations are recorded in the lead-in part 31, the video and audio informations are muted in the processing output unit 6. Since a plurality of control programs are recorded in the digital audio data sub-channel which is reproduced in the lead-in part 31, said plural control programs are extracted from the playback signal by means of the extract unit 3, and this is

transferred to the memory unit 4 by means of the control unit 5, and stored therein.

At the point of read-out ending of control program, the program area 32 is played back under the instruction made by the control unit 5, and predetermined processings are conducted for each of playback signals in the processing output unit 6, for producing output audio and video informations. In this playback, the explanations for the optical-disk software which is an animal encyclopedia, and the video and audio informations giving the instructions for operating said playback unit by barcodes, are given. At the ending of operation instruction, the playback apparatus is pasued, and turned into a waiting condition for another barcode input by the user. Thus, at this condition, the barcodes recorded in the barcode memory medium 8, and consistent with the optical disk 1 set in the optical-disk playback apparatus, become executable. That is, the playback of optical-disk 1 becomes controllable by the barcode commands made by the user.

When a user, as he is looking into a barcode memory medium 8 which is an animal encyclopedia, traces the barcode printed on a side of explanations by a barcode reading unit 7, the traced barcode is transformed into an ID code and operation code in the barcode reading unit 7, and these are transmitted to the control unit 5.

These ID code and operation code are compared with the stored disk ID code and control program in the control unit 5, and if these made a discrepancy, the cancellation of barcode input is conducted, and a program information for error processing at the optical-disk 1, e.g., a message telling "this disk is an animal encyclopedia, please input the correct barcode" is sent to the playback unit 2 which displays this message.

When a coincidence of both disk ID codes is obtained, the control unit 5 retrieves the control program corresponding to the operation code out of plural control programs, and executes the compound command of control programs having a corresponding operation code. The execution of compound command is performed by the sequential executions of control commands constituting said compound command. The control unit 5, as it executes said control commands, outputs control informations to the playback unit 2 if it is a control operation to the playback unit 2, and outputs control informations to the processing output unit 6 if it is a control operation to the processing output unit 6.

The playback unit 2 received the control information, plays back the optical-disk 1 according to said control information, and processing output unit 6 turns ON/OFF of video and audio informations according to the input control information.

In an example of barcode 62, the operation code and disk ID code are read by the barcode reading unit 7, and these codes are transferred to the control unit 5 where the received operation and disk ID codes are compared with the stored disk ID codes for the coincidence, and reproduces error processing program if any discrepancies were found. If a coincidence between these two ID codes is found, control programs corresponding to the operation codes read by barcode reader is retrieved from plural control programs stored in the memory unit 4 by the control unit 5.

The compound command to be stored in the control programs corresponding to the barcode 62 consists of four control commands which are sequentially executed, and its first command is a playback command for the starting frame a to the ending frame a+100, the second control command is for the starting frame a+300 to the ending frame a+400, the third command is for the starting frame a+500 to the ending frame a+600, and the fourth command is a command for the starting frame a+700 to the ending frame a+800.

After the first control command is executed at first, the control unit 5 instructs the playback unit 2 to playback the part from the starting frame a to the ending a+100. The playback unit 2 starts playback of optical-disk 1 from the frame number a according to the control information, and the playback signal derived from the playback unit 2 is transformed into the audio and video informations which are output externally through processing output unit 6. As the playback unit 2 monitors the frame number of playback signal, the playback is terminated when the frame number a+100 is detected.

The control unit 5 recognized the ending of playback by receiving a status information, executes the second control command. That is, it instructs the playback unit 2 to playback the part from the starting frame a+300 to the ending frame a+400, thus the playback unit 2 starts playback from the frame number a+300 and ends the playback at the ending frame a+400. Likewise, the third command and the fourth command are executed.

At the ending of the fourth control command execution, the playback apparatus is brought into a pause condition for preparing for another barcode input by the user. The above described operations of control unit 5 are better understood by a flowchart of control unit 5 shown in Fig. 8.

According to the above described embodiment, any person who prepared the disk-software can define a barcode system by which the operation of it can be specified, and by interpreting the read barcodes by the barcode reading unit 7 by using said software particular control programs recorded in the optical-disk 1, the operations depending on individual disk becomes executable. Furthermore, since plural control commands can be allocated for one barcode, complicated and various operations of apparatus can be realized very easily without requiring increased barcode informations such as the employments of elongated barcode or the reading of plural barcodes.

Further, even if a wrong combination of compound memory medium consisting of barcode memory medium 8 and optical-disk 1 is attempted, so far as a correlationship is found between the barcode of barcode memory medium 8 and the control program recorded in the optical-disk 1, the playback apparatus suspends the operation of playback unit 2, and meaningless play-back for the user can be prevented. The second embodiment of optical-disk playback apparatus, method of optical-

disk playback, and its combined memory medium of this invention are explained in the following referring the accompanied drawings. This is an embodiment wherein the succeeding operation codes for read are interpreted by the control programs recorded in the optical-disk, once a specific escape code is read.

Since the block diagram of this optical-disk playback apparatus, and the optical-disk frame, sub-code frame, control program contained in the optical-disk, and control program for the pack, compound command, control command and bar-code module are identical with those of the first embodiment, the explanations for these are omitted here.

Fig. 6C shows a page spread of animal encyclopedia which is a barcode memory medium of this embodiment, Fig. 6D is a diagram of program information constitution recorded on the optical-disk 1 together with these frame numbers. The barcode memory medium 8 is an animal encyclopedia here, and Fig. 6C shows a page containing the informations related to the elephants. 71 and 72 are barcodes, and the operation code A is recorded in the barcode 71, and the escape code is recorded at the location of character number shown in Fig. 7A, and the disk ID code and operation code B are recorded thereafter.

The disk ID codes, as shown by the first embodiment, are unique numbers employed to specify the correlationship between the barcode memory medium 8 and optical-disk 1. The escape codes are the playback apparatus proper codes independent of optical-disk to be played back, and are common codes between different optical-disk playback apparatus, such those simple commands of playback, playback ending, pause, search, multi-speed playback, etc. which should have been prepared by the playback apparatus itself. The escape code is utilized to switch the control programs which is to correlate the input operation code to the operation of apparatus between the plural control programs recorded in the optical-disk 1 and the apparatus proper control program independent of the content of optical-disk.

That is, the interpretation is normally conducted by using the apparatus proper control programs independent of the content of optical-disk to be reproduced, but, once the escape code is detected, the operation code recorded in the same barcode for the escape code, switches the retrieval of corresponding control programs to the control programs recorded in the optical-disk.

There are two types of operation codes, i.e. the operation codes A and B. The operation code A is a code to be interpreted by an apparatus proper control program independent of predetermined optical-disk contents to specify an apparatus operation. The operation code A is comprised of a control code to define the playback operation, etc., and a frame code attached to said control code. In a case of control code without requiring the frame code, "no operation" which specifies nothing to be done is recorded in place of said frame code.

The operation code B is a code to specify a particular control program out of plural control programs recorded in the optical-disk 1. 71 is a barcode to specify the playback of "outline of elephant", and 72 is a barcode to instruct the playback of "short highlight" wherein the outline of elephant is reproduced in a period much shorter than that for the barcode 71.

The frame numbers of each program informations to be played back by barcodes 71 and 72 on the optical-disk 1 are shown in Fig. 6D, thus the contents of "outline of elephant" corresponding to the barcode 71 are recorded in the area from frame number a to a+900. The contents of "short highlight" corresponding to the barcode 72 consists of the parts included in the program information of "outline of elephant", and these are recorded in three parts with frame numbers of a to a+200, a+300 to a+600, and a+700 to a+800.

The control program selected by the operation code is defined as follows as for the examples of "outline of elephant" and "short highlight". The operation code A represented by the barcode 71 consists of a control code to specify the playback operation and two frame codes having frame numbers a and a+900. Moreover, since an escape code is recorded at the first position of the barcode 72, the following operation code B is selected out of the control programs recorded in the optical-disk. The operation code B is defined to as a compound command consisting of three control commands for playbacks of the frame numbers a to a+200, a+300 to a+600, and a+700 to a+800 among corresponding control commands.

When an optical-disk of this embodiment is played back in a conventional optical-disk playback apparatus of which operations corresponding to each of barcodes are fixed, the "outline of elephant" can be reproduced since its operation code is the one defined within the predetermined control programs proper to the playback apparatus and independent of the content of the optical-disk.

Moreover, "outline of elephant" can be naturally played back when playback is conducted by using an optical-disk playback apparatus of this embodiment, and if the playback of "short highlight" is instructed by the barcode 71, the control program is switched to playback "short highlight" by means of said escape code. As described above, by recording the escape code, the interchangeability between the combined memory medium of the second embodiment and the conventional optical-disk playback apparatus can be accomplished.

The formats of disk ID code and operation code to be recorded as the barcodes are explained by referring Fig. 7A.

The barcodes conforming the standard of UPC codes are used in this case. This barcode of this embodiment consists of 12 characters like to UPC standard code. Fig. 7A is a schematic diagram of data recorded as a barcode wherein the first character shows the character number. In this embodiment, the escape code to select the control program is recorded on its character number position.

When the first character is an escape code, the

characters from the second to sixth are utilized as the disk ID code, the characters from the seventh to eleventh are utilized as the operation code B, and the twelfth character is utilized as a check digit.

When the first character is not an escape code, the characters from the second to eleventh are utilized as the operation code A (not shown), and the twelfth character is utilized as a check digit.

The disk ID code is a unique number determined by the types of disk-software such as the animal, human body, and plant encyclopedia, and is to prevent erratic operations when an umatched combination of barcode memory medium 8 and optical-disk 1 took place.

The operation code A is a code to be interpreted by an optical-disk playback apparatus proper predetermined control program independent of the content of optical-disk. The operation code B is a code required to select a desired program among plural control programs recorded in the optical-disk 1. The check digit is used for the error detection at the reading of barcodes.

The details and operations of the elements constituting an optical-disk playback apparatus are explained in the next referring Figs. 1, 2, and 9. Fig. 1 is a schematic diagram showing the functions of optical-disk playback apparatus, Fig. 2 shows a more detail of Fig. 1, and Fig. 9 is a flow-chart showing the operations of control unit 5 of this embodiment. Since the constituting elements of each unit, and the operations of these except those of control unit 5 are identical with those of first embodiment, these are omitted here.

The explanations on the operations of control unit 5 of this embodiment are as follows. When an optical-disk 1 is set in the playback apparatus, the microprocessor 232 outputs a control information to start the playback from the lead-in part 31 through the I/O buffer 231 for the playback unit 2.

When the plural control programs extracted by the extract unit 3 are input to the control unit 5 from the data-decoder 21, the microprocessor 232 sends out control programs to the memory unit 4 through the buffer 229 and internal bus d30.

Meanwhile, when the barcode is read at the barcode read unit 7, the microprocessor 232 reads out the character number, operation code, and disk ID code stored in the register 237 of barcode read unit 7 through the input buffer 230, and since these codes are BCD codes, the microprocessor 232 converts these codes into binary numbers of 16 bits.

The microprocessor 232, then judges if the converted character numbers indicates the escape code or not, and if it is not the escape code, the reference to the control programs proper to the optical-disk playback apparatus stored in ROM 228 is made, and the command corresponding to the operation code succeeding to said control program is executed.

If the character number is an escape code, a comparison between the disk ID code and disk ID code stored in the memory unit 4 is conducted, and if these are different, the microprocessor 232 cancels the input made by the barcode. If these are coincided, corresponding control programs are selected out of the plural control programs stored in the memory unit 4, and the compound command defined by said control programs is executed, or the plural control commands constituting the compound command are sequentially executed.

In a more concrete expression, the control information d32 is given to the playback unit 2 through the I/O buffer 231, and for the processing output unit 6, the control signals d23, d24, and d25 which instruct ON/OFF to each switch block through the output latch 233 are given.

The above described operations of control unit 5 in the optical-disk playback apparatus of this embodiment is shown by the flowchart of control unit 5 shown in Fig. 9.

According to this embodiment, by using the escape code, a barcode operable by the apparatus proper control program independent of the optical-disk content and predetermined by the optical-disk playback apparatus itself and a barcode operable by the control program recorded in the optical-disk can be simultaneously recorded on a single barcode memory medium 8, and by this, the combined memory medium of this embodiment can be played back by the conventional optical-disk playback apparatus of which operations corresponding to the barcodes are fixed within the apparatus, attaining the interchangeability of optical-disk.

In addition to the above, the explained optical-disk 1 was LV disk of CAV system in both the first and second embodiments, but the scope of this invention is not limited by the type of optical-disks so far as these are capable to record the audio, video, or both of them. For example, this is applicable to CD on which only digital audio data is recorded, compact video-disk (CD-V, hereafter) which is capable to record the digital audio data and analog video data, LV of CLV system, and the write-once disk (W/O, hereafter).

Since the recording is made at a constant speed for the LVs of CD-V or CLV systems, a frame memory which could be incorporated in the processing output unit 6 is necessary for reproducing still pictures. Whereas the control programs are stored in this playback apparatus of this embodiment preceding the playback of the program part 32 when an optical-disk is set in the apparatus, the storing of control programs preceding the playback of program part 32 is not essential, and an alternative is that the playback of the part wherein the control program is recorded may be executed whenever a barcode is input in this case.

Moreover, whereas the lead-in part 31 is assigned as a physical location on which the control programs are recorded on the optical-disk in this embodiment, the physical location of control programs is not limited to this location, and, for example, it can be recorded on the lead-out part 33 or the program part 22.

Furthermore, as the control programs are recorded as a sub-channel data of digital audio signal in this embodiment, the recording signals are not limited to the above, and for example, the lower bit of digital audio data can be substituted by the control programs, or it can be recorded as a Manchester

code during a period of vertical blanking period of analog video signals.

Although the usages of compound memory medium as an animal encyclopedia are shown in this embodiment, usages are not limited within this application, but it is applicable to other encyclopedia such as for the plants, merchandise catalogs, teaching materials, entertainment materials, and various other purposed.

An example of teaching materials, language learning can be made highly effective by utilizing CD and barcode system. That is, a foreign language such as French or German sentences and corresponding barcodes are printed and recorded on a barcode memory medium 8 and CD respectively, and the desired audio informations recorded on said CD can be easily retrieved by a user by simply tracing a corresponding barcode printed on said barcode memory medium by a barcode read unit 7.

Although only the printed barcode patterns consisting only black and white module are shown in this embodiment, the type of barcode is not limited within this, but a barcode pattern printed by an ink legible only by infrared ray can be also used. Since the barcode is invisible by naked eyes, it can be highly effectively to construct a textbook layout, and it can be used for preparing attractive memory medium 8.

Claims

1. An optical-disk playback apparatus by which an optical-disk on which informations including control programs specifying said optical-disk playback apparatus are recorded can be playback, consists of:
a playback means to playback said optical-disk for deriving said recorded informations;
an extract means to extract said recorded control programs to output;
a memory means to store said control programs output from said extract means;
a processing output means to process said informations other than said control programs to output;
a barcode read means to read barcodes from said memory on which said barcodes are recorded for converting said read barcodes into operation codes to output;
a control means to which said opeation codes are input to interpret operation contents indicated by said operation codes by using said control programs stored in said memory means or control programs which are proper said apparatus and independent of said optical disk contents predetermined by said optical-disk playback apparatus itself, and to control both said playback means and said processing output means according to said interpreted operations.

2. A method to playback an optical-disk on which informations including plural control programs specifying the operations of said optical-disk playback apparatus are recorded, consists of:
read out of operation codes printed on a memory medium as barcodes, and playback of said optical-disk according to control programs corresponding to said read operation codes.

3. A method to playback an optical-disk on which informations including plural control programs specifying the operations of said optical disk playback apparatus are recorded, consists of:
read out of operation codes printed on a memory medium as barcodes,
extraction of control programs corresponding to said operation codes from said plural control programs read in advance,
and playback of said optical-disk according to said extracted control programs.

4. A method to playback an optical-disk on which informations including plural control programs specifying the operations of said optical disk playback apparatus are recorded, consists of:
read out codes printed on a memory medium as barcodes, and playback of said optical-disk according to control programs corresponding to operation codes subsequently read if said codes are specific ones.

5. A method to playback an optical-disk on which informations including plural control programs specifying the operations of said optical disk playback apparatus are recorded, consists of:
read out of operation codes printed on a memory medium as barcodes,
interpretation of subsequently input operation code into corresponding operations by using said control programs read in advance from said optical-disk if said codes are specific codes,
and playback of said optical-disk according to said interpreted operations.

6. A method to playback an optical-disk on which informations including plural control programs specifying the operations of said optical disk playback apparatus are recorded, wherein operation codes printed on a memory medium as barcodes is read out, and in playback of said optical-disk conducted according to control programs corresponding to read operation codes, said plural control programs constitute a microcommand made of plural connections of elemental operations predetermined by said optical-disk playback apparatus itself.

7. A method to playback an optical-disk on which informations including plural control programs specifying the operations of said optical disk playback apparatus are recorded, wherein operation codes printed on a memory medium as barcodes is read out,
control programs corresponding to operation code are extracted from plural control programs read in advance from said optical-disk, and in playback of said optical-disk conducted according to extracted control programs, said

plural control programs constitute a microcommand made of plural connections of elemental operations predetermined by said optical-disk playback apparatus itself.

8. A combined memory medium comprised of an optical-disk and a barcode memory medium on which barcodes are recorded, wherein plural control programs defining operations of optical-disk playback apparatus by which said optical-disk is played back are recorded in said optical-disk, and operation codes specifying the operations among said plural control programs are printed as barcodes on said barcode memory medium.

9. An optical-disk playback apparatus by which an optical-disk on which informations including control programs specifying said optical-disk playback apparatus are recorded can be playback, consists of:

a playback means to playback said optical-disk for deriving said recorded informations;

an extract means to extract said recorded control programs to output;

a memory means to store said control programs output from said extract means;

a processing output means to process said informations other than said control programs to output;

a code read means to read codes from printed material on which said codes are printed for converting said read codes into operation codes to output;

a control means to which said operation codes are input to interpret operation contents indicated by said operation codes by using said control programs stored in said memory means or control programs which are proper said apparatus and independent of said optical-disk contents predetermined by said optical-disk playback apparatus itself, and to control both said playback means and said processing output means according to said interpreted operations.

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FIG. 1

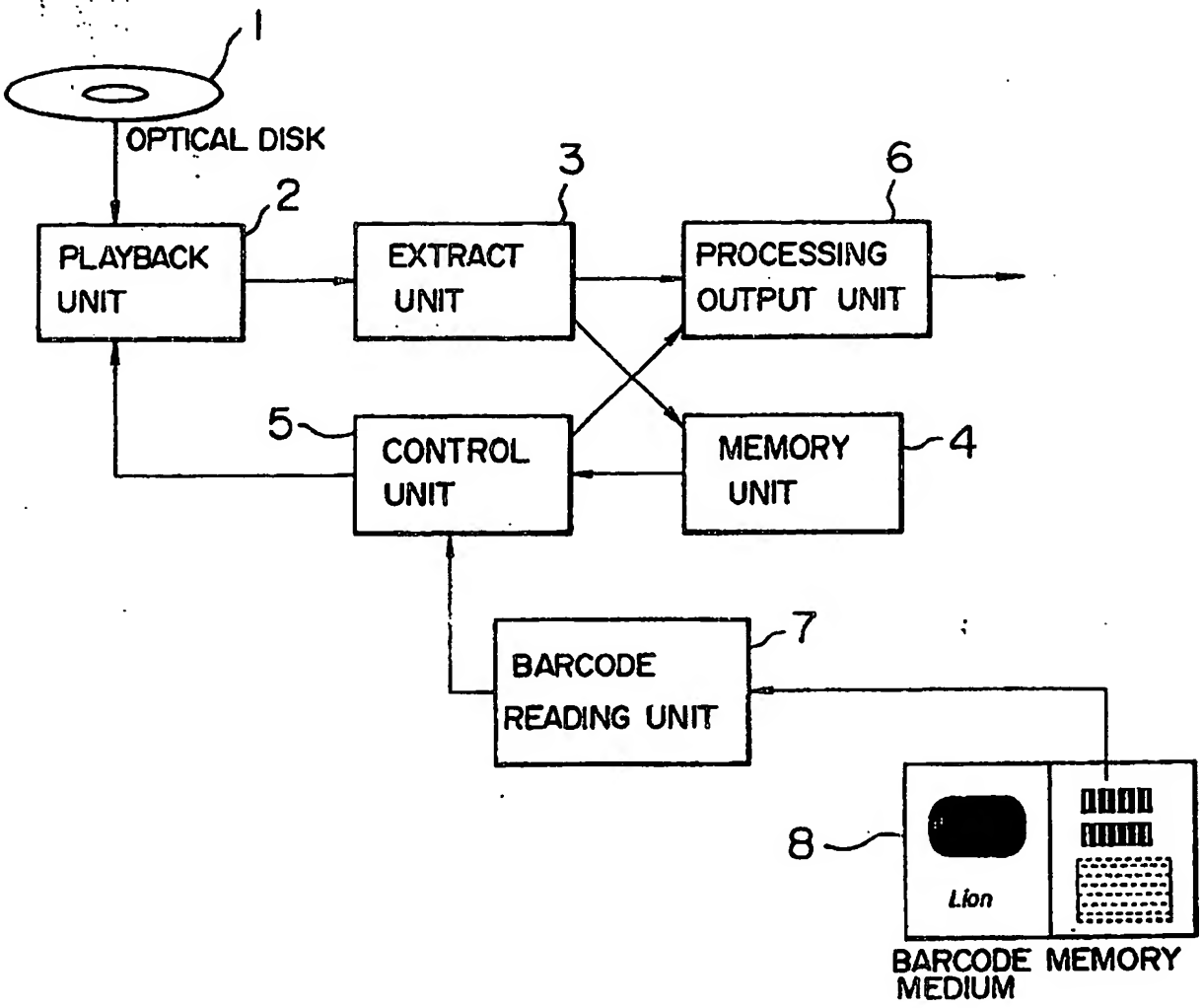


FIG. 2

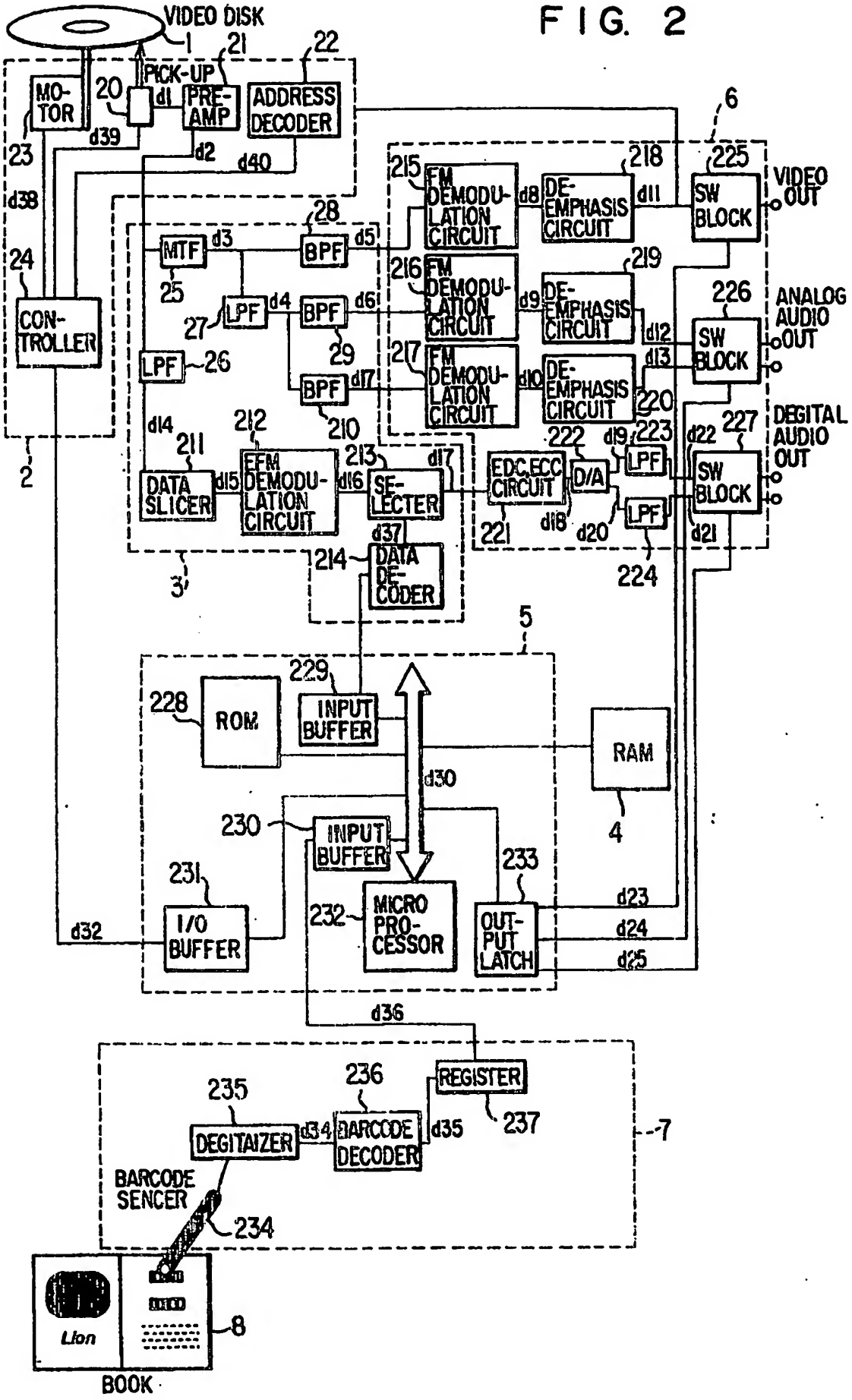

VIDEO DISK
1
21
22
PICK-UP
MO-TOR
20
d1
PRE-AMP
ADDRESS DECODER
d39
d2
d40
23
d38
24
CON-TROLLER
2
28
MTF
d3
BPF
d5
25
LPF
d4
BPF
d6
27
29
LPF
26
BPF
d7
210
d14
211
212
DATA SLICER
d15
EFM DEMODU-LATION CIRCUIT
d16
213
SE-LECTER
d17
3
214
DATA DE-CODER
6
215
FM DEMODU-LATION CIRCUIT
d8
DE-EMPHASIS CIRCUIT
218
d11
225
SW BLOCK
VIDEO OUT
216
FM DEMODU-LATION CIRCUIT
d9
DE-EMPHASIS CIRCUIT
219
d12
226
SW BLOCK
ANALOG AUDIO OUT
217
FM DEMODU-LATION CIRCUIT
d10
DE-EMPHASIS CIRCUIT
d13
220
227
SW BLOCK
DEGITAL AUDIO OUT
EDC.ECC CIRCUIT
221
222
D/A
d19
LPF
223
d22
d18
d20
LPF
d21
224
5
228
ROM
229
INPUT BUFFER
RAM
d30
4
230
INPUT BUFFER
231
233
I/O BUFFER
d32
232
MICRO PRO-CESSOR
OUT-PUT LATCH
d23
d24
d25
d36
REGISTER
235
236
237
DEGITAIZER
d34
BARCODE DECODER
d35
7
BARCODE SENCER
234
Lion
8
BOOK

FIG. 3

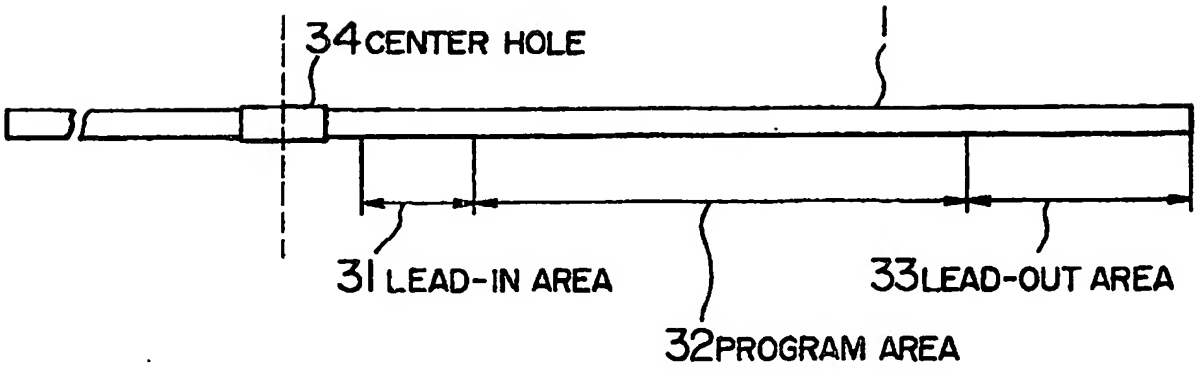


FIG. 4A

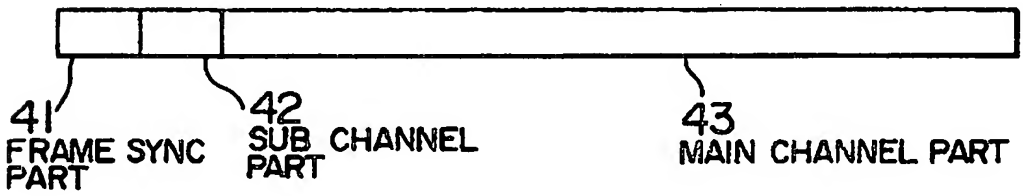


FIG. 4B

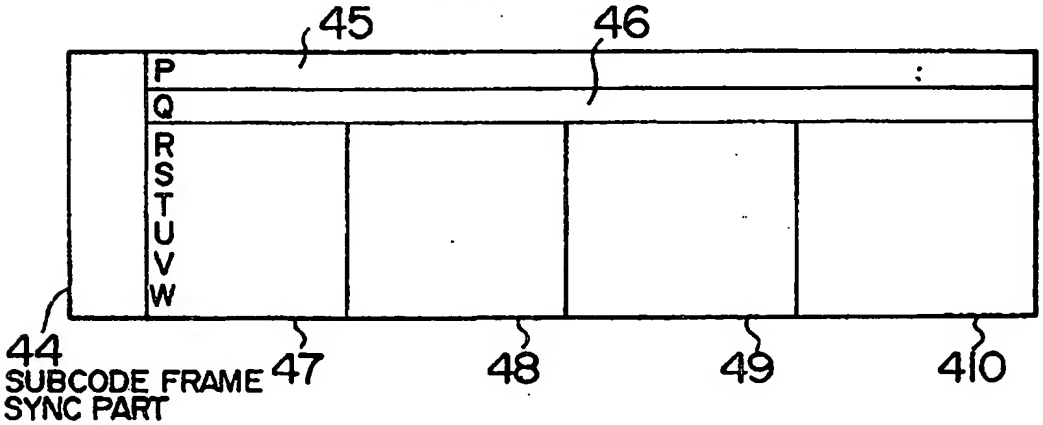


FIG. 4C

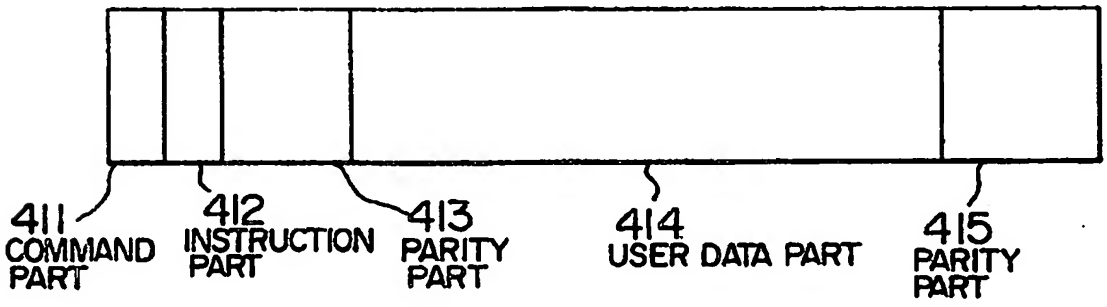


FIG. 5A

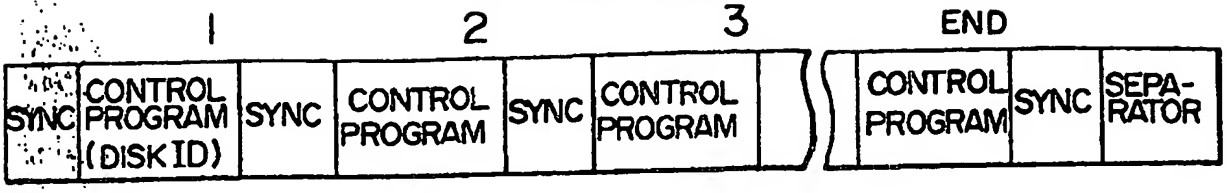
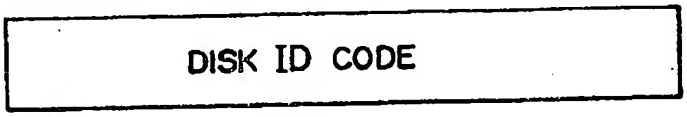


FIG. 5B

CONTROL PROGRAM (DISK ID)



CONTROL PROGRAM

FIG. 5C

COMPOUND COMMAND

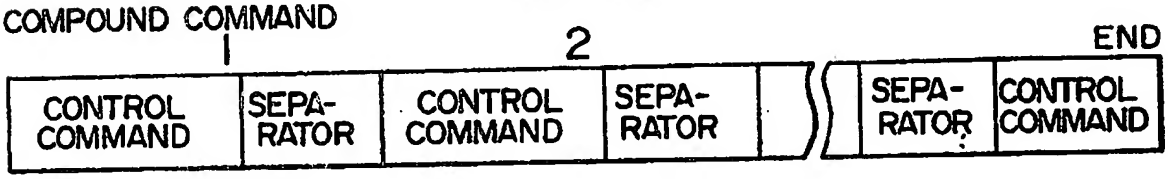
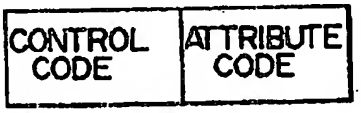


FIG. 5D

CONTROL COMMAND (0 FRAME TYPE)



CONTROL COMMAND (1 FRAME TYPE)

CONTROL COMMAND (2 FRAME TYPE)

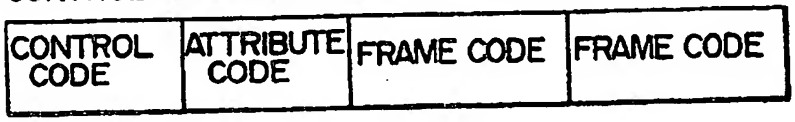


FIG. 5E

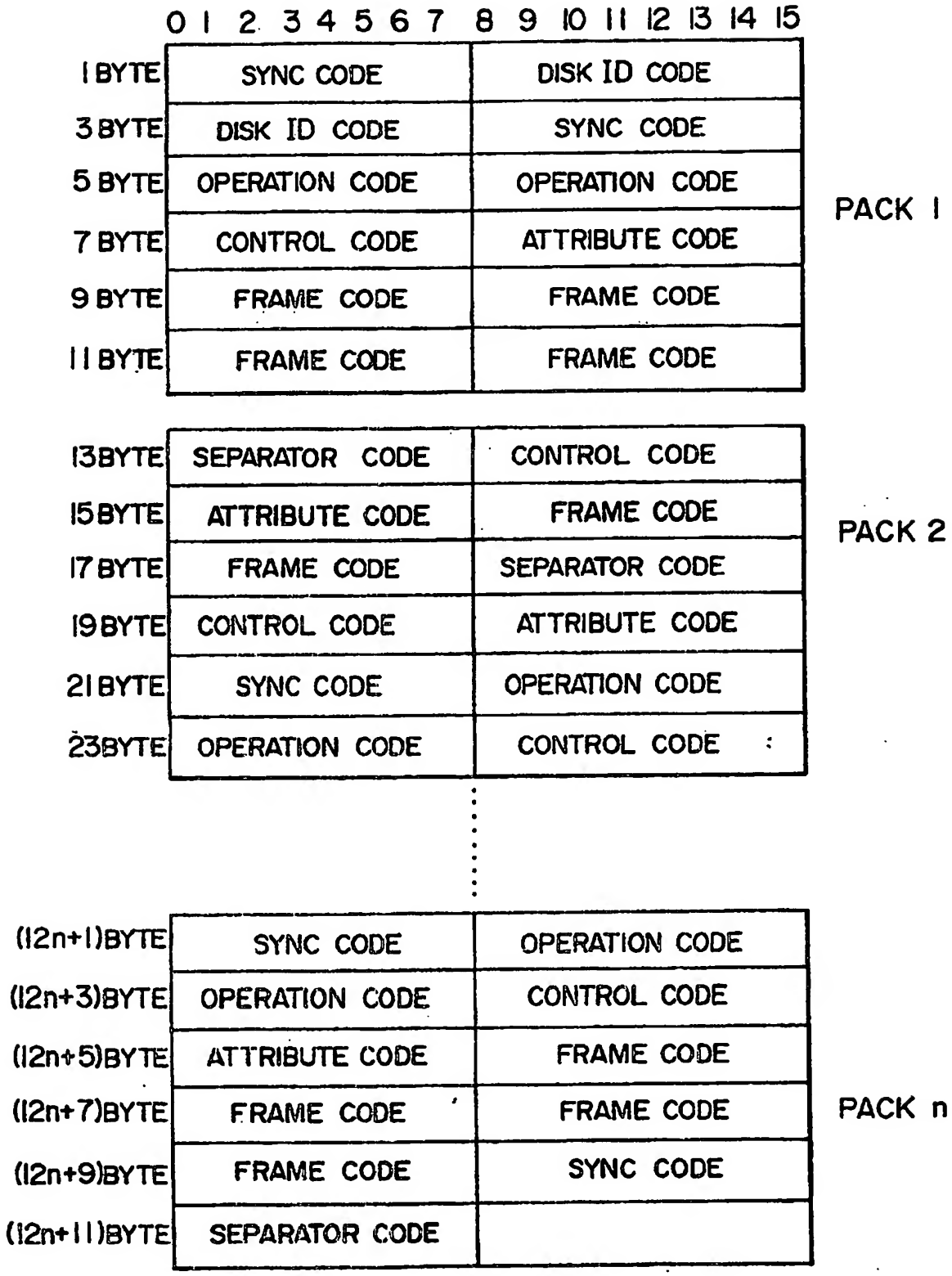

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 BYTE
SYNC CODE
DISK ID CODE
3 BYTE
DISK ID CODE
SYNC CODE
5 BYTE
OPERATION CODE
OPERATION CODE
7 BYTE
CONTROL CODE
ATTRIBUTE CODE
9 BYTE
FRAME CODE
FRAME CODE
11 BYTE
FRAME CODE
FRAME CODE
PACK 1
13BYTE
SEPARATOR CODE
CONTROL CODE
15BYTE
ATTRIBUTE CODE
FRAME CODE
17 BYTE
FRAME CODE
SEPARATOR CODE
19BYTE
CONTROL CODE
ATTRIBUTE CODE
21BYTE
SYNC CODE
OPERATION CODE
23BYTE
OPERATION CODE
CONTROL CODE
PACK 2
(12n+1)BYTE
SYNC CODE
OPERATION CODE
(12n+3)BYTE
OPERATION CODE
CONTROL CODE
(12n+5)BYTE
ATTRIBUTE CODE
FRAME CODE
(12n+7)BYTE
FRAME CODE
FRAME CODE
(12n+9)BYTE
FRAME CODE
SYNC CODE
(12n+11)BYTE
SEPARATOR CODE
PACK n

FIG. 6A

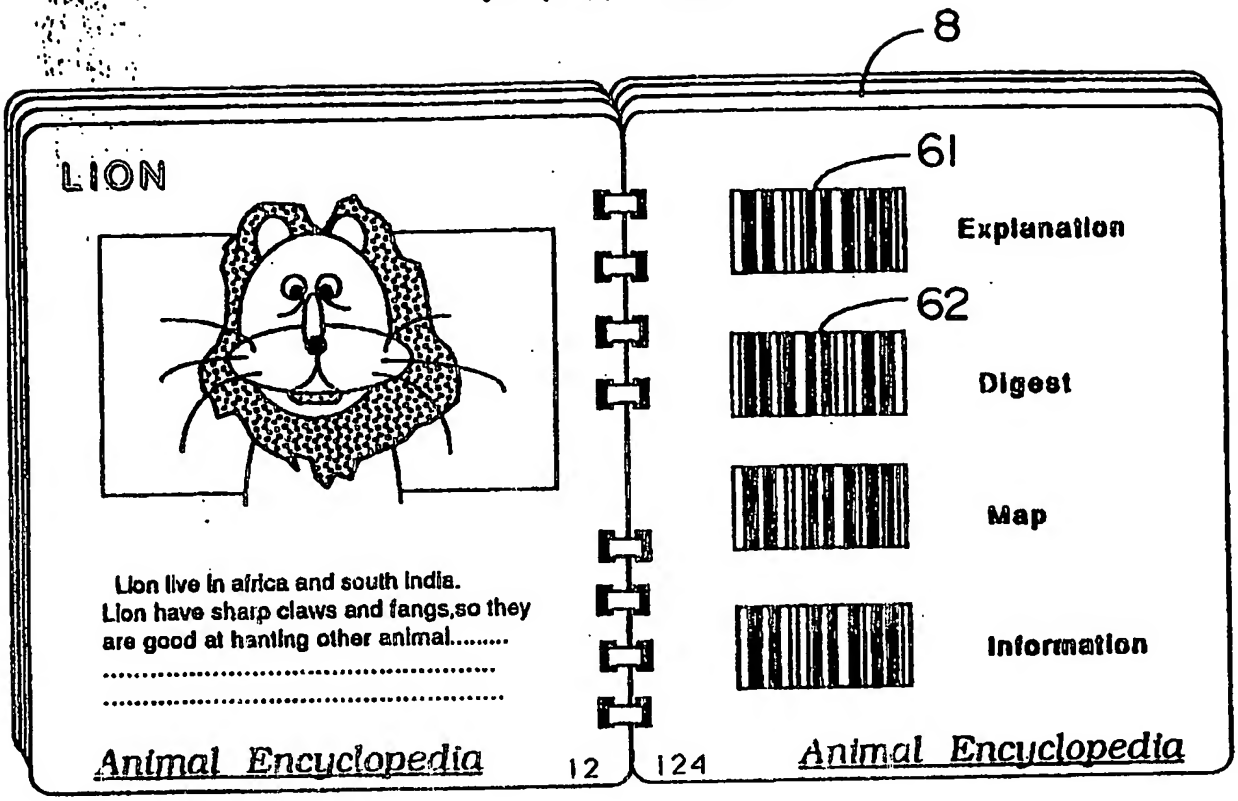

8
LION
Lion live in africa and south India.
Lion have sharp claws and fangs,so they
are good at hanting other animal.....
.....
.....
Animal Encyclopedia
12
124
61
Explanation
62
Digest
Map
Information
Animal Encyclopedia

FIG. 6B

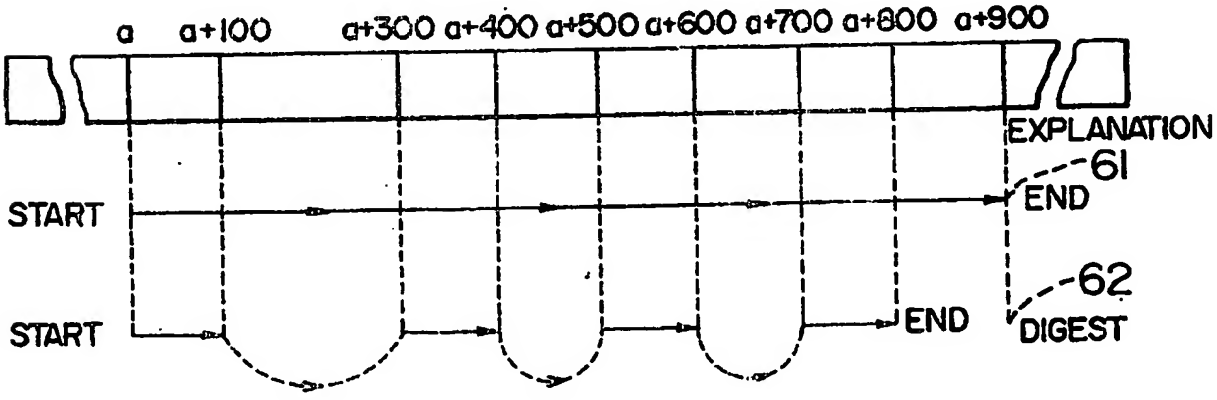

a
a+100
a+300
a+400
a+500
a+600
a+700
a+800
a+900
EXPLANATION
61
START
END
62
START
END
DIGEST

FIG. 6C

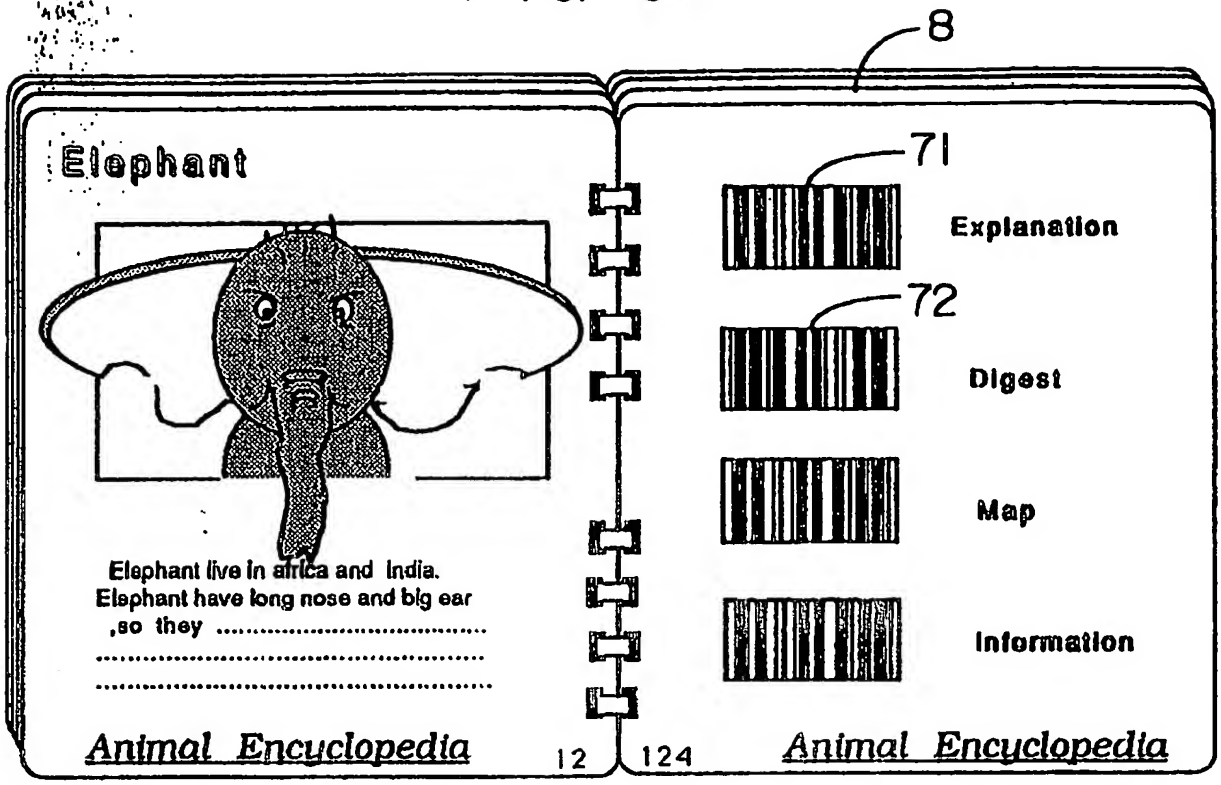

8
Elephant
Elephant live in africa and India.
Elephant have long nose and big ear
,so they .....
.....
.....
Animal Encyclopedia
12
124
71
Explanation
72
Digest
Map
Information
Animal Encyclopedia

FIG. 6D

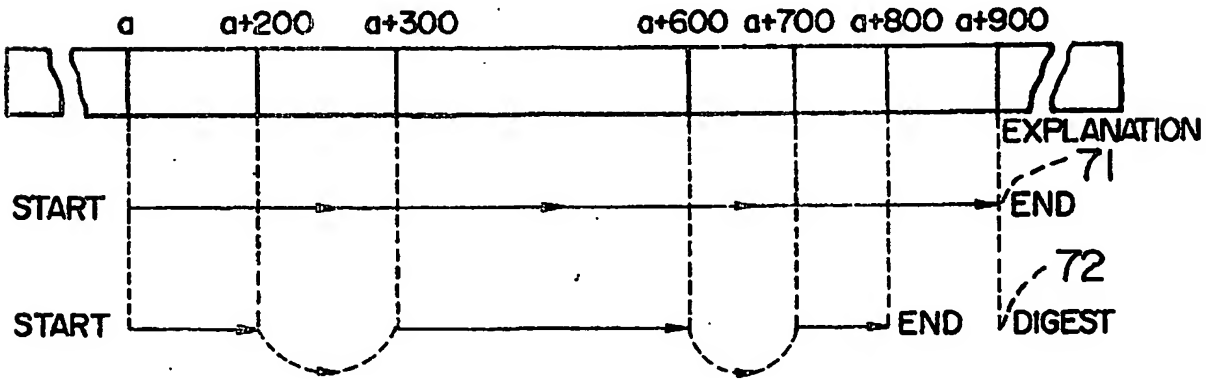

a
a+200
a+300
a+600
a+700
a+800
a+900
EXPLANATION
71
START
END
72
START
END
DIGEST

FIG. 7A

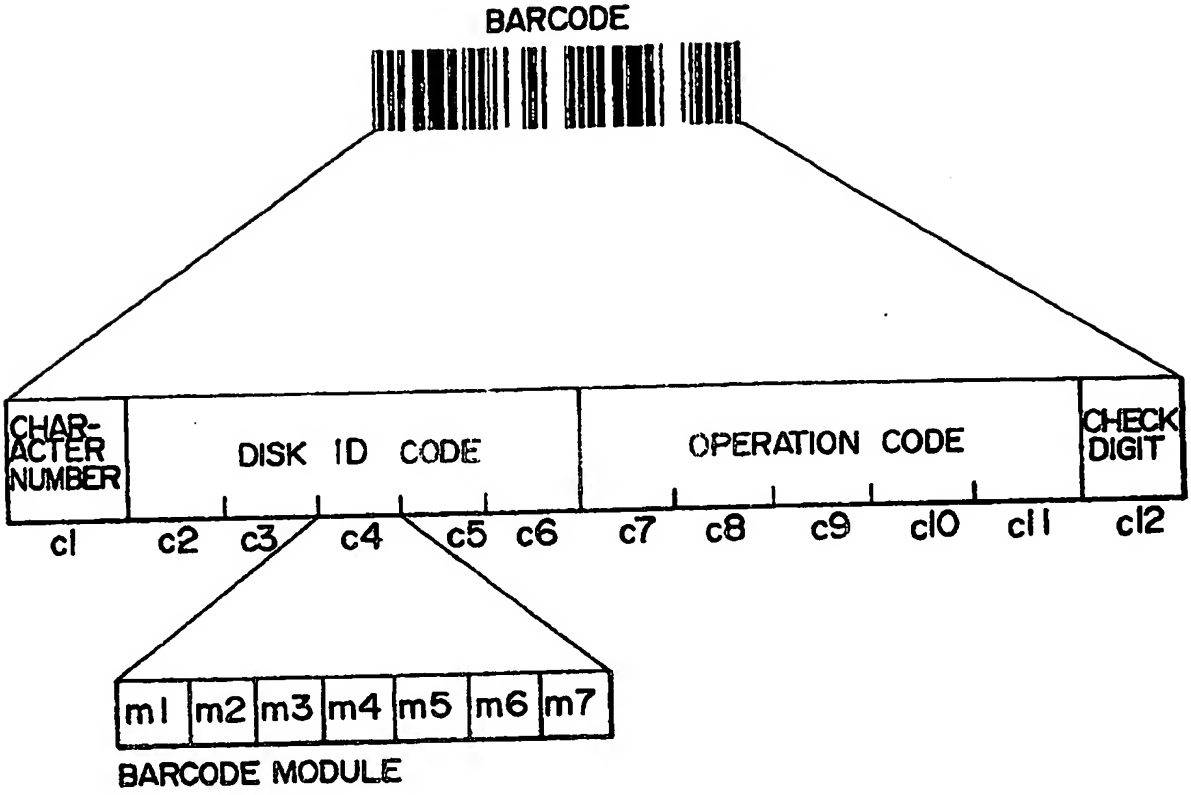


FIG. 7B

BARCODE MODULE

0 : WHITE
1 : BLACK

m1	m2	m3	m4	m5	m6	m7	DIGIT
0	0	0	1	1	0	1	0
0	0	1	1	0	0	1	1
0	0	1	0	0	1	1	2
0	1	1	1	1	0	1	3
0	1	0	0	0	1	1	4
0	1	1	0	0	0	1	5
0	1	0	1	1	1	1	6
0	1	1	1	0	1	1	7
0	1	1	0	1	1	1	8
0	0	0	1	0	1	1	9

cX (X=1....12)

FIG. 8

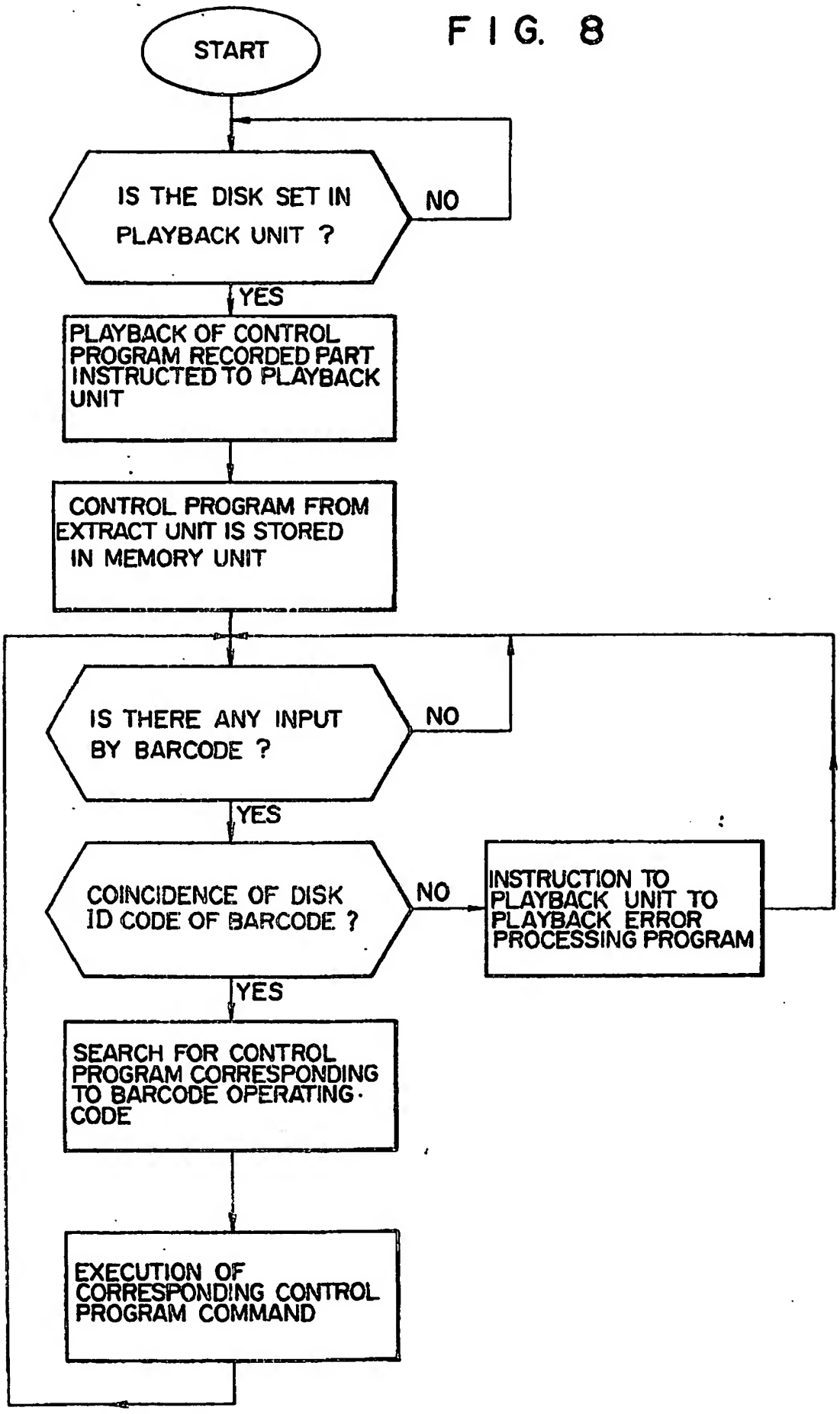
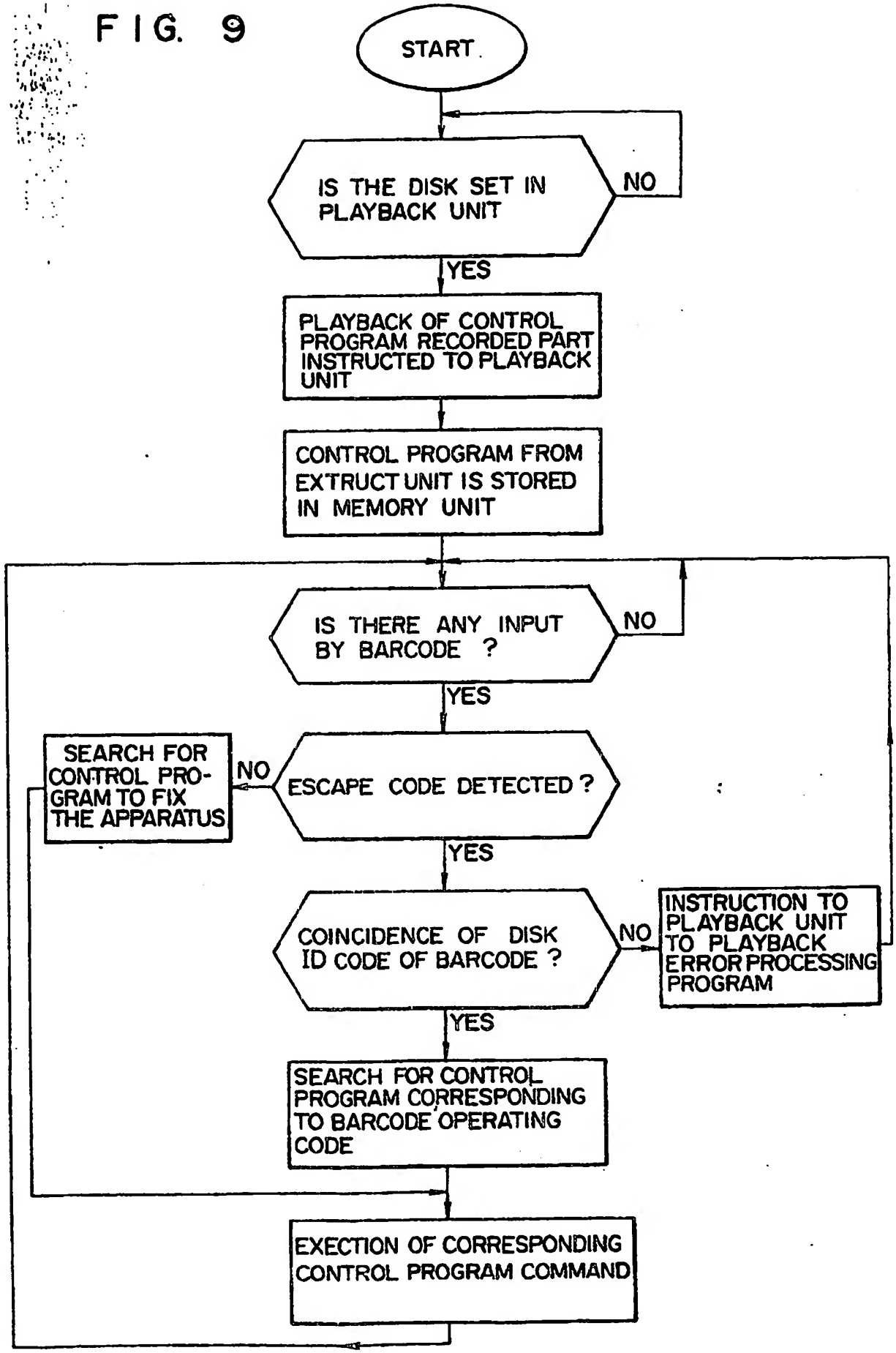

START
IS THE DISK SET IN PLAYBACK UNIT ?
NO
YES
PLAYBACK OF CONTROL PROGRAM RECORDED PART INSTRUCTED TO PLAYBACK UNIT
CONTROL PROGRAM FROM EXTRACT UNIT IS STORED IN MEMORY UNIT
IS THERE ANY INPUT BY BARCODE ?
NO
YES
COINCIDENCE OF DISK ID CODE OF BARCODE ?
NO
INSTRUCTION TO PLAYBACK UNIT TO PLAYBACK ERROR PROCESSING PROGRAM
YES
SEARCH FOR CONTROL PROGRAM CORRESPONDING TO BARCODE OPERATING CODE
EXECUTION OF CORRESPONDING CONTROL PROGRAM COMMAND

FIG. 9


START
IS THE DISK SET IN PLAYBACK UNIT
NO
YES
PLAYBACK OF CONTROL PROGRAM RECORDED PART INSTRUCTED TO PLAYBACK UNIT
CONTROL PROGRAM FROM EXTRUCT UNIT IS STORED IN MEMORY UNIT
IS THERE ANY INPUT BY BARCODE ?
NO
YES
SEARCH FOR CONTROL PRO-GRAM TO FIX THE APPARATUS
NO
ESCAPE CODE DETECTED ?
YES
COINCIDENCE OF DISK ID CODE OF BARCODE ?
NO
INSTRUCTION TO PLAYBACK UNIT TO PLAYBACK ERROR PROCESSING PROGRAM
YES
SEARCH FOR CONTROL PROGRAM CORRESPONDING TO BARCODE OPERATING CODE
EXECTION OF CORRESPONDING CONTROL PROGRAM COMMAND